Waves

NAME: .....

Generating Waves:

Start by visiting this web site:
http://webphysics.ph.msstate.edu/javamirror/suren/Applets/Waves/Twave01A/Twave01AApplet.html
This simulation shows a device used for producing a Wave on a string. Our task is to figure out the parameters that affect (or determines) the frequency or the amplitude of the wave.

1. Change the frequency of the wave and observe what happens.
2. Change the amplitude and observe what happens.
3. What do you concludes? What factors determine the amplitude and frequency of the wave?

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Transverse Wave Pulses:

Start by visiting this web site:
http://webphysics.ph.msstate.edu/javamirror/suren/Applets/Waves/TwaveRefTran/TwaveRefTranApplet.html

4. Select “Free end reflection” and press the “Start” button.
5. Describe what you observe (how does the pulse move, does it speed up or slow down, does it flip, …):

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6. Select “Fixed end reflection” and press the “Start” button.
7. Describe what you observe:

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8. Select “Thicker to thinner” and press the “Start” button.
9. Describe what you observe:

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10. Select “Thinner to thicker” and press the “Start” button.
11. Describe what you observe:

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Conclusions:

1. When does the pulse flip? Think of at least two situations.

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2. When does the pulse remain upright (does not flip)? Think of at least three situations.

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3. What kind of conclusion can you draw about the speed of the wave?

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Longitudinal Waves:

Start by visiting this web site:
http://webphysics.ph.msstate.edu/javamirror/suren/Applets/Waves/Lwave01/Lwave01Applet.html

4. Select "Pulsed Rarefaction" and press the "Start" button.
5. Describe what you observe (how does the pulse move, does it speed up or slow down, …):

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6. How does this compare to the pulse you have observed for Transverse Waves?

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Interference:

Start by visiting this web site: http://science.kennesaw.edu/~tmzoughi/physlets/waves-titus-interf-sin.htm
We start by using option C: Superposition of two identical (in phase: a crest for one corresponds to a crest for the other; amplitudes are the same) sinusoidal waves traveling in the same direction. Click on the corresponding link and press on the play button. Note that the simulation is made up of three components. The top one shows one wave, the second shows the other wave and the third shows the sum of both waves. Please note that whenever you need to make a measurement, you might need to press the "Stop" button. Describe what you observe:

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Press the “Stop” button and measure the amplitude of the first wave (position the cursor on top of a crest and press the mouse key, two numbers appear. The one labeled as F is then the amplitude):

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Measure the amplitude of the second wave: .....

Measure the amplitude of the combined wave: .....

Do the results agree with what you expect? Explain:.....

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Now select option D: Superposition of two sinusoidal waves traveling in the same direction. These waves are in phase (a crest in one corresponds to a crest in the other), but they have different amplitudes. Describe what you observe:

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Press the “Stop” button and measure the amplitude of the first wave:.....

Measure the amplitude of the second wave: .....

Measure the amplitude of the combined wave: .....

Do the results agree with what you expect? Explain:.....

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Now select option A: Superposition of two sinusoidal waves traveling in the same direction. These waves are out of phase (a crest in one corresponds to a trough in the other), they also have the same amplitude. Describe what you observe:

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Press the “Stop” button and measure the amplitude of the first wave:.....

Measure the amplitude of the second wave: .....

Measure the amplitude of the combined wave: .....

Do the results agree with what you expect? Explain:.....

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Now select option B: Superposition of two sinusoidal waves traveling in the same direction. These waves are out of phase (a crest in one corresponds to a trough in the other), they also have different amplitudes. Describe what you observe:

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Press the "Stop" button and measure the amplitude of the first wave:.....

Measure the amplitude of the second wave: .....

Measure the amplitude of the combined wave: .....

Do the results agree with what you expect? Explain:.....

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Standing Waves:

Start by visiting this web site: http://science.kennesaw.edu/~tmzoughi/physlets/waves-titus-interf-standing.htm
We use option C: Superposition of two identical (amplitudes are the same) sinusoidal waves traveling in opposite directions. The other options are just there for you to compare results. Describe what you observe pay more attention to describing the resulting wave. You might also want to note the direction each wave is traveling):

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1. Why do you think they call this type of waves (we are talking about the superposition) "standing waves"?

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Now visit this web site: http://science.kennesaw.edu/~tmzoughi/physlets/waves-duffy_standing_string-fixed.htm
This simulation shows standing waves on string fixed at both ends. We focus on the combined wave (actual string). The other options are just there for you to compare results. Describe what you observe:

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2. If the size of the string in that case is 20.0 m, what is the wavelength of the wave you are observing?

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3. Assume the frequency of the wave to be 0.05 Hz, what is then the speed of the wave?

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4. **Bonus:** The frequency of the wave is actually 0.05 Hz, can you explain how you can determine that by running the simulations?

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5. Press the "2.0" button to invoke the first harmonic. Describe what you observe:

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6. If the size of the string in that case is 20.0 m, what is the wavelength of the wave you are observing?

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7. Using the speed you have determined in part 3, find is the frequency of the wave you are observing?

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8. Press the "3.0" button to invoke the second harmonic. Describe what you observe:

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9. If the size of the string in that case is 20.0 m, what is the wavelength of the wave you are observing?

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10. Using the speed you have determined in part 3, find is the frequency of the wave you are observing?

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Now visit this web site: http://science.kennesaw.edu/~tmzoughi/physlets/waves-duffystanding_string-fixed-free.htm
This simulation shows standing waves on string (rod) fixed at one end, the other end is free.

11. Describe what you observe.

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12. If the size of the string in that case is 20.0 m, what is the wavelength of the wave you are observing?

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13. Assume the frequency of the wave to be 0.025 Hz, what is then the speed of the wave?

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14. Press the "3.0" button to invoke the first harmonic. Describe what you observe:

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15. Using the speed you have determined in part 13, find is the frequency of the wave you are observing?

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16. Press the "5.0" button to invoke the second harmonic. Describe what you observe:

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17. Using the speed you have determined in part 13, find is the frequency of the wave you are observing?

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Now visit this web site: http://science.kennesaw.edu/~tmzoughi/physlets/waves-duffystanding_string-free.htm
This simulation shows standing waves on string (rod) where the two ends are free to vibrate.

18. Describe what you observe.

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19. If the size of the string in that case is 20.0 m, what is the wavelength of the wave you are observing?

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20. Assume the frequency of the wave to be 0.05 Hz, what is then the speed of the wave?

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21. Press the "2.0" button to invoke the first harmonic. Describe what you observe:

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22. Using the speed you have determined in part 20, find is the frequency of the wave you are observing?

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23. What do you conclude about Standing waves:

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24. The parts of the waves that do not move are called nodes, the parts were motion is the largest are called antinodes. What do you observe at a fixed end, a node or an antinode?

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25. What do you observe at a loose end, a node or an antinode?

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Opinion: Provide your feedback about this activity

What did this activity help you learn? .....

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What was confusing about this activity? .....

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How would you make this activity better? .....

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